**CLAIMS**

1. A method for forming metal deposits on a substrate comprising:

a) depositing a photosensitive organometallic compound onto a substrate;

b) irradiating the photosensitive organometallic compound with UV radiation;

c) reducing the irradiated photosensitive organometallic compound to form metal deposits adhered to the substrate; and

d) removing any degraded photosensitive organometallic compound residue and unaffected photosensitive organometallic compound from said substrate.

2. A method for forming metal deposits on a substrate according to claim 1 wherein the reduction process in step c) comprises:

1) a first heating and cooling stage;

2) a second heating and cooling stage in an oxidising atmosphere;

3) flowing an inert gas over the substrate; and

4) a third heating and cooling stage wherein a reducing gas flows over the substrate to form metal deposits.

3. A method for forming metal deposits on a substrate according to any of claims 1 or 2 wherein the metal deposits are of any shape or configuration such as a substantially continuous thin 'sheet-like' film or a substantially narrow line of nanometre dimensions.

4. A method for forming metal deposits on a substrate according to any preceding claim wherein metal lines of less than 70 nm are formed on the substrate.

5. A method for forming metal deposits on a substrate according to any of claims 2 to 4 wherein the first heating and cooling stage are in an inert atmosphere such as a noble gas, e.g. dinitrogen.

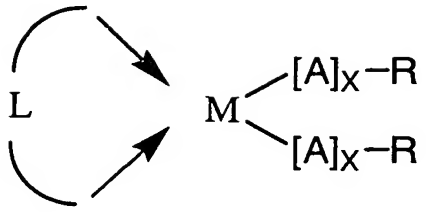
6. A method of forming metal deposits on a substrate according to any of claims 2 to 5 wherein the second heating and cooling stage is performed in a dioxygen containing atmosphere such as air.

7. A method of forming metal deposits on a substrate according to any of claims 2 to 6 wherein the reducing gas in the third heating and cooling stage comprises at least dihydrogen.

8. A method of forming metal deposits on a substrate according to any preceding claim wherein the photosensitive organometallic compound is a platinum organometallic.

9. A method of forming metal deposits on a substrate according to any of claims 1 to 7 wherein the photosensitive organometallic compound contains any of the following metals: palladium, copper, rhodium, tungsten, iridium, silver, gold and tantalum.

10. A method of forming metal deposits on a substrate according to any of claims 1 to 7 wherein the photosensitive organometallic compounds are compounds of formula (I) as described below:




(I)

wherein:

M is any of platinum, palladium, copper, rhodium, tungsten, iridium, silver, gold and tantalum;

A is any of oxygen, sulphur, an amide grouping, an amine grouping or an ester grouping;

x is 0 or 1;

R is a fluoroorgano group; and

L is a bidentate ligand.

11. A method of forming metal deposits on a substrate according to any of claims 1 to 7 wherein the photosensitive organometallic compounds are selected from any of the following: bis-(perfluoropropyl)-1,5-cyclooctadiene platinium (II); bis-(perfluoropropyl)-1-methyl-1,5-cyclooctadiene platinum (II); and bis-(perfluoropropyl)-1-fluoromethyl-1,5-cyclooctadiene platinum (II).

12. A method of forming metal deposits on a substrate according to any preceding claim wherein the organometallic compound is deposited using any of the following: a vacuum coating technique, a spinning technique, a surface tension coating technique or a hot spray technique.

13. A method of forming metal deposits on a substrate according to any preceding claim wherein a thin film of about 100mg of photosensitive organometallic is deposited onto a substrate.

14. A method of forming metal deposits on a substrate according to any preceding claim wherein the UV radiation has a wavelength of about 260nm.

15. A method of forming metal deposits on a substrate according to any preceding claim, the reduction process comprises:

(1) heating the coated substrate from about 25°C to about 120°C at a ramp rate of about 2°C per minute; maintaining the temperature at about 80°C for about 60 minutes; and then cooling the substrate from about 80°C to about 25°C at a ramp rate of about 10°C per minute; wherein $N_2$ is flowed over the coated substrate at a rate of about 50ml per minute;

(2) heating the substrate from about 25°C to about 250°C at a ramp rate of about 5°C per minute; maintaining the temperature at about 250°C for about 60 minutes; and then cooling the substrate from about 250°C to about 25°C at a ramp rate of about 5°C per minute; wherein the coated substrate is exposed to air;

(3) flowing $N_2$ at about 25°C over the coated substrate for about 10 minutes; and

(4) heating the coated substrate from about 25°C to about 350°C for about 60 minutes; and then cooling the substrate from about 350°C to about 25°C at a rate of about 20°C per minute; wherein a mixture of about 5% $H_2$ and 95% $N_2$ is flowed over the coated substrate at a rate of about 150ml per minute.

16. A method of forming metal deposits on a substrate according to any of claims 1 to 14 wherein the reduction process comprises:

1) heating the coated substrate from about 25°C to

about 120°C at a ramp rate of about 2°C per minute; maintaining the temperature at about 80°C for about 60 minutes; and then cooling the substrate from about 80°C to about 25°C at a ramp rate of about 10°C per minute; wherein $N_2$ is flowed over the coated substrate at a rate of about 50ml per minute;

2) heating of the substrate from about 25°C to about 350°C at a ramp rate of about 20°C per minute; maintaining the temperature at about 350°C for about 60 minutes; and then cooling the substrate from about 350°C to about 25°C at a ramp rate of about 20°C per minute; wherein the coated substrate is exposed to air;

3) flowing $N_2$ at about 25°C over the coated substrate for about 10 minutes; and

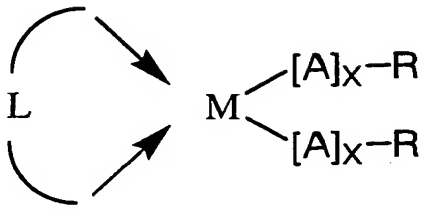
4) heating the coated substrate from about 25°C to about 350°C at a ramp rate of about 20°C per minute; maintaining the temperature at about 350°C for about 60 minutes; and then cooling the substrate from about 350°C to about 25°C at a rate of about 20°C per minute; wherein a mixture of about 5% $H_2$ and 95% $N_2$ is flowed over the coated substrate at a rate of about 150ml per minute.

17. Metal deposits formed according to any of claims 1 to 16.

18. Metal deposits according to claim 17 wherein the metal deposits have a width of about 60nm to 20nm.

19. Metal deposits according to any of claims 17 and 18 wherein the metal deposits have a thickness of about 5nm to 20nm.

20. Compounds according to the following formula (I):




(I)

wherein:

M is any of platinum, palladium, copper, rhodium, tungsten, iridium, silver, gold and tantalum;

A is any of oxygen, sulphur, an amide grouping, an amine grouping or an ester grouping;

x is 0 or 1;

R is a fluoroorgano group; and

L is a bidentate ligand.

21. Compounds according to claim 20 wherein A is oxygen.

22. Compounds according to any of claims 20 and 21 wherein x is 0.

23. Compounds according to any of claims 20 to 22 wherein the fluoroorgano group is selected from any fluoro derivatives of the following: a $C_{1-12}$ alkyl, a $C_{1-12}$ alkenyl, a $C_{1-12}$ alkynyl or a $C_{1-12}$ aryl grouping which are substituted or unsubstituted and/or linear or branched.

24. Compounds according to any of claims 20 to 22 wherein the fluoroorgano group is selected from any fluoro derivatives of the following: a $C_{1-4}$ alkyl, a $C_{1-4}$ alkenyl, a $C_{1-4}$ alkynyl or a $C_{1-4}$ aryl grouping which are substituted or unsubstituted or linear or branched.

25. Compounds according to any of claims 20 to 24 wherein

the bidentate ligand comprises two olefin groups, and as such may be 1,5-cyclooctadiene or derivatives of thereof such as 1-methyl-1,5-cyclooctadiene and 1-fluoromethyl-1,5-cyclooctadiene.

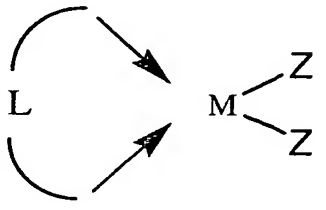
26. Compounds according to any of claims 20 to 24 wherein the bidentate ligand is cyclooctatetraene or derivatives thereof.

27. Compounds according to claim 20 wherein the compounds are bis-substituted (perfluoroorgano) cyclooctadiene platinum (II) compounds.

28. Compounds according to claim 20 wherein the compounds are selected from any of the following: bis-(perfluoropropyl)-1,5-cyclooctadiene platinum (II); bis-(perfluoropropyl)-1-methyl-1,5-cyclooctadiene platinum (II); and bis-(perfluoropropyl)-1-fluoromethyl-1,5-cyclooctadiene platinum (II).

29. A process for forming compounds according to any of claims 20 to 28 comprising forming a reaction mixture of:

a) compounds according to formula (II) as shown below:




(II)

wherein:

M is any of platinum, palladium, copper, rhodium, tungsten, iridium, silver, gold and tantalum;

L is a bidentate ligand; and

Z is an organo grouping;

and

b) compounds defined as follows according to

formula (III):

$$H-[A]_x-R \qquad (III)$$

wherein:

h is a halide;

A is any of oxygen, sulphur, an amide grouping, an amine grouping or an ester grouping;

x is 0 or 1; and

R is a fluoroorgano grouping;

and subjecting the reaction mixture to conditions such that compounds according to formula (I) are formed.

30. A process according to claim 29 wherein the mixing of the reaction mixture is performed under darkness or in ambient conditions.

31. A process according to any of claims 29 or 30 wherein the compound shown by formula (II) is in a solvent.

32. A process according to any of claims 29 to 31 wherein the compound shown by formula (I) is obtained by filtering off the precipitate and evaporating off any remaining solvent or any other volatile substances.

33. A process according to claim 32 wherein the obtained precipitate is purified by redissolving the obtained precipitate in a solvent and running the obtained solution down a chromatographic column and collecting the fraction containing the purified compound of formula (I) and then crystallising the collected fraction from, for example, a solution of methylene chloride/pentane solution.

34. A process according to any of claims 29 to 33 wherein the compound shown by formula (III) is selected from any of the following: perfluoroorgano-iodide, perfluoroorgano-

bromide, perfluoroorgano-chloride and perfluoroorgano-fluoride.

35. A process according to any of claims 29 to 34 wherein the organo group of the fluoroorgano group in formula (II) or formula (III) is selected from any of the following: a $C_{1-12}$ alkenyl, a $C_{1-12}$ alkenyl, a $C_{1-12}$ alkynyl or a $C_{1-12}$ aryl grouping which is substituted or unsubstituted and/or linear or branched.

36. A process according to any of claims 29 to 34 wherein the organo group of the group in formula (II) or formula (III) is selected from any of the following: a $C_{1-4}$ alkyl, a $C_{1-4}$ alkenyl, a $C_{1-4}$ alkynyl or a $C_{1-4}$ aryl grouping which is substituted or unsubstituted or linear or branched.

37. A process according to any of claims 29 to 36 wherein the compound shown by formula (III) is selected from any of the following: n-perfluoropropyl iodide; and perfluorobutyl iodide.

38. A process according to any of claims 29 to 37 wherein the mixing of the reaction mixture takes place under an inert atmosphere and comprises shaking for five days.

39. A process according to any of claims 29 to 38 wherein the compound shown by formula (II) is a bis-substituted organo platinum (II) cyclooctadiene compound.

40. A process according to any of claims 29 to 39 wherein the compound formed according to formula (I) is selected from any of the following: bis-(perfluoropropyl)-1,5-cyclooctadiene platinum (II); bis(perfluoropropyl)-1-methyl-1,5-cyclooctadiene platinum (II); and bis-(perfluoropropyl)-1-fluoromethyl-1,5-cyclooctadiene platinum (II).